

R2O Initiative for the Next Generation Global Prediction System (NGGPS) Internal NWS Announcement of Opportunity

Summary: The primary goal of the National Oceanic and Atmospheric Administration (NOAA) National Weather Service (NWS) is to protect American lives and property with the timely provision of reliable weather, water, climate and environmental information. This information supports and protects the Nation's social and economic development, resulting in a weather ready nation. In order to build a weather-ready nation, NWS must have access to cutting edge weather prediction techniques and develop them for operations. Over the next five years, the NWS will design, develop, and implement a Next Generation Global Prediction System (NGGPS) that accelerates extension of useful weather forecasting skill to 30 days by incorporating the most advanced models and technology available from current research and development, into an operational system.

NGGPS will be comprised of components based on an atmospheric model (dynamic core and a suite of atmospheric physics) that is coupled to models for the ocean, waves, sea ice, land surface and aerosols. Supporting functions for data assimilation systems and ensemble design and initialization are also included. Developing this global prediction system entails identifying candidate components that have the potential to contribute to the complete system, identifying any scientific gaps therein, and modifying/customizing the components to incorporate them into the new system. The resulting process will offer an accelerated research-to-operations pathway. This transition of research into operation initiative will start by selecting a dynamic core from existing alternatives, and incorporating the improved model components and systems into the NEMS framework.

The NWS is soliciting proposals under the R2O Initiative for the NGGPS for FY 2015 from NOAA, Navy, and the National Aeronautics Space Administration (NASA) laboratories for the scientific development of the various model components. This Announcement of Opportunity is for the scientific research and development of components that are aligned to contribute to the design, development and implementation of the NGGPS. This project seeks to support research that accelerates extension of useful forecasting skill to 30 days and are aligned with the following focus areas:

- Atmospheric physics - The physical parameterization suite to improve the deterministic and probabilistic forecast guidance.
- Aerosol model and physics - Improvement in the representation of distribution, amount and composition of aerosols and their effects on clouds, radiation and assimilation of satellite observations in weather and climate models.
- Atmospheric, ocean, wave, ice, and land surface models – Upgraded, fine-tuned modeling system components efficiently coupling with other modeling components.
- Data assimilation – Research to improve forecast accuracy through the use of information received in real-time from observing systems such as surface observations, satellite instruments, ships, commercial aircraft, buoys, and other components.
- Ensemble development – Improving the probabilistic forecast guidance of high-impact weather elements by decreasing initial condition and model uncertainty and improving product calibration.

Eligibility: Proposals will be considered from federal agency employees (NOAA, Navy, NASA); resident researchers from cooperative institutions or contractor personnel may submit proposals as co-PI's.

Deadline: **Proposals should be submitted via email to Fred Toepfer** (frederick.toepfer@noaa.gov), **Ivanka Stajner** (ivanka.stajner@noaa.gov), and **Stephen Lord** (stephen.lord@noaa.gov) **by 5 p.m. EDT October 31, 2014.** Late proposals will not be considered.

Funding Availability: NOAA/NWS anticipates that at least ten projects up to \$200K each will be funded for the first year. Awarded funds must be obligated in FY2015. Laboratories should expect to receive funding in November 2014. Where appropriate, labs are encouraged to leverage work done at other agencies.

Project Period: This announcement is for project periods of up to one year. Proposals should be submitted with budget and work plans for one year. For multi-year efforts, follow-on proposals must be submitted each year to be considered for funding.

Submission Requirements for Proposals: To facilitate expedient and quality review, the requirements for preparation of proposals provided below are mandatory (except where otherwise noted). Failure to adhere to these requirements will result in proposals being returned without review.

- A. A brief abstract containing a summary of the work to be completed and its alignment with NWS NGGPS goals. (See Appendix A for additional information.)
- B. A Statement of Work that includes:
 - (1) The name of the PI and any co-investigators, including affiliations
 - (2) The proposed duration of the project (up to two years)
 - (3) A description of the research or development and its coordination with existing projects
 - (4) A work plan and schedule for the research, including a timeline with key milestones (at least two annually)
 - (5) Proposals that involve model or data assimilation development should include a plan for testing and evaluating of the new capabilities. A hierarchy of testing should be proposed, ranging from demonstration of at least comparable performance to existing model capabilities, to case studies, to multi-season tests to demonstrate achievement of benchmarks in objective, subjective and engineering readiness required for transition to operations.
 - (6) An explanation of why this work will have a significant scientific impact
 - (7) Identify the NGGP component to which the project has the potential to contribute and how. An informal acknowledgement of coordination could be included (email, letter) and will not count against page limits.
- C. Applicants must submit a budget including any scientific and technical support staff salaries, grants, contracts, computing, equipment (provide justification), indirect charges, and travel. Include cost of other resources not charged to the project (leveraging).
- D. The proposal shall not exceed 5 pages, including figures, using 12-point font and 1-inch margins.

Evaluation Criteria: The proposals will be evaluated by the Review panel based on the following criteria in this order:

- A. Scientific/Technical merit. This criterion assesses whether the proposed approaches in the work plan are technically sound and/or innovative and if the methods are appropriate. (50%)
- B. Importance/relevance of proposal to the goals of this solicitation. This criterion ascertains whether there is intrinsic value in the proposed work and relevance to NOAA's mission and the potential for impact to the NGGPS. (30%)
- C. Overall Qualification of Applicants and Partners. This criterion ascertains the overall scientific/technical experience and qualifications of the project team. (10%)
- D. Project Costs. This criterion evaluates the budget to determine if it is realistic and commensurate with the project needs and time-frame. In order to maximize the number of these projects, higher scores will be given to smaller funding requests and/or those with the most leveraging. (10%)

For proposals that are extremely close in value, the Selection Board will additionally consider programmatic balance.

Selection Procedures: Proposals will be evaluated and ranked by reviewers selected by the R2O Executive Oversight Board (EOB) who are unconflicted and not involved with any of the submitted proposals that they are evaluating and who are familiar with global model initiative components and goals. The Selection Board will present the recommended proposals to the EOB for final approval and selection. NWS will endeavor to make selections and transfer funds in November 2014. The NOAA/NWS/OST Office will facilitate the review and selection process.

Annual Project Review: All funded proposals will submit quarterly progress reports to the NOAA/NWS Office for review by the OST Office. A final report shall be submitted to the NWS/OST Office at the end of the project documenting results and potential next steps.

Appendix A.

Additional information regarding NGGPS Goals:

The NWS Research to Operations (R2O) Initiative is a NOAA initiative to expand and accelerate critical weather forecasting research to operations to address growing service demands and increase the accuracy of weather forecasts. The R2O Initiative supports the expansion and acceleration of R2O activities associated with improving weather forecasts through improvements to NOAA's operational environmental prediction suite. Targeted improvements in the suite will result in multiple weather forecast service improvements. This will be achieved through, (1) accelerated development and implementation of improved global weather prediction models; (2) improved data assimilation techniques; (3) nested regional prediction capabilities; (4) post-processing forecast tools and techniques; and (5) improved software architecture and system engineering. The objectives of NGGPS include:

- Select an atmospheric dynamic core from existing research and operational models
- Improve model physics packages to better describe weather phenomenon
- Accelerate development and implementation of weather prediction model components, such as ocean, wave, sea ice, land surface and aerosol models; and improve coupling between the component model systems
- Improve Data Assimilation Techniques by developing advanced data assimilation methods at global and regional scales and for specific storms such as hurricanes
- Improve software architecture and systems engineering:
 - Build a high-performance, flexible software infrastructure to increase ease of use, performance, and interoperability
 - Investigate effective use of emerging HPC technologies; simplification of software structure; and a community-based model infrastructure which will streamline the incorporation of proven research advances into operations.
- Increase resolution of key environmental models to improve the specificity of forecasts
- Enhance probabilistic forecast systems by including more ensemble members at higher resolution.
- Conduct data impact studies of future observing systems such as the next-generation satellites to enable both rapid incorporation of future observing systems data and guide observing systems strategies and requirements.

Scientific research and development for the advancement of individual model components is paramount to the success of this next generation global model. As the component models are modified, tested, and upgraded, each component must be able to be coupled to the next generation model and contribute to the improvement in forecasting, while not diminishing computational performance.